



SEQUENCE LISTING

<110> MARINE BIOTECHNOLOGY INSTITUTE CO., LTD.
Yasuhiro NISHIDA et al.

<120> NOVEL CAROTENOID HYDROXYLASE GENE, METHOD FOR PREPARING HYDROXYLATED
CAROTENOID, AND NOVEL GERANYLGERANYL PYROPHOSPHATE SYNTHASE

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<140> US 10/579,338
<141> 2006-05-15

<150> JP 2003/388165

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<151> 2004-06-03

<160> 38

<170> PatentIn Ver. 2.1

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tcgccccatctg cagtatggac gacgaggcca gacgtcccc gcccgtcatg gc ^g atgaccc 11618 gcagggagtc cctcaa ^t atgc cgggtgtcca t ^g atgaagtt cagcccg ^t c ^g cgg ^t ccggca 11678 tcagaatgtc caccagcacg gcgtcggcg accagtcc ^t c gacgatccgc aacc ^t cg ^t c ^g t 11738 tgaccgttgc tgcgg ^t cagg acttggcaac ccagccgtt cagcatctcc tccagatgaa 11798 gcagaaccag cgaatcg ^t cc tcgatcacgc agactttcac gccc ^t ac ^t tc cagatgc ^t cat 11858 cagggggAAC taacggatga atccatgtt gcgtcaactc ggaagacggc gtttccgact 11918 ggccatcgcc ttggcg ^t cg ^t cg ^t cc ^t gc ^t g ^t ac ^t g ^t cc ^t act ^t g ^t ggg ^t gac ^t g ^t ct 11978 gcaacgagaa ttc	11991

<210> 3
<211> 774
<212> DNA
<213> Brevundimonas sp.

<220>
<221> CDS
<222> (1)..(771)

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ggc ctg cgc tat ctg ctg gtc g ^g g ^c g ^c g ^c cat ggg ctg ctg tgg Gly Leu Arg Tyr Leu Leu Val Gly Ala Ala Ala His Gly Leu Leu Trp 20 25 30	96
gcc ggg g ^c g ^c g ^c g ^c g ^c aac ctg cgg ccg ccg g ^c atg	144

Ala	Gly	Ala	Gly	Arg	Gly	Arg	Ala	Leu	Asn	Leu	Arg	Pro	Pro	Ala	Met		
35				40							45						
aag	cgc	atc	cgc	gcc	gag	atc	gtc	gcc	tcc	ctg	atc	gcc	tgc	ccc	atc	192	
Lys	Arg	Ile	Arg	Ala	Glu	Ile	Val	Ala	Ser	Leu	Ile	Ala	Cys	Pro	Ile		
50				55						60							
tac	gcc	ctg	ccg	gca	gtc	ctg	gag	ctg	tgg	aag	cg	ggc	ggg		240		
Tyr	Ala	Leu	Pro	Ala	Ala	Leu	Val	Leu	Glu	Leu	Trp	Lys	Arg	Gly	Gly		
65				70					75			80					
acg	gca	atc	tac	agc	gat	ccc	gac	gcc	tgg	ccc	ctg	tgg	tgg	ctg	ccg	288	
Thr	Ala	Ile	Tyr	Ser	Asp	Pro	Asp	Ala	Trp	Pro	Leu	Trp	Trp	Leu	Pro		
85				90						95							
gtc	agt	ctg	atc	gtc	tat	ctg	ctg	gca	cac	gac	gcc	ttc	tac	tac	tgg	336	
Val	Ser	Leu	Ile	Val	Tyr	Leu	Leu	Ala	His	Asp	Ala	Phe	Tyr	Tyr	Trp		
100				105						110							
gtg	cac	agg	gcc	ctg	cat	cac	ccg	cg	gtc	ttc	ggc	tgg	gcc	cat	gcc	384	
Val	His	Arg	Ala	Leu	His	His	Pro	Arg	Val	Phe	Gly	Trp	Ala	His	Ala		
115				120						125							
gaa	cac	cac	cgg	tcg	cg	gac	ccc	agc	gcc	ttc	gcc	tcc	ttc	gcc	ttc	432	
Glu	His	His	Arg	Ser	Arg	Asp	Pro	Ser	Ala	Phe	Ala	Ser	Phe	Ala	Phe		
130				135						140							
gac	ccg	gcc	gag	gtc	g	cc	acc	gcc	tgg	ttc	ctg	ccc	gcc	ctg	gcc	480	
Asp	Pro	Ala	Glu	Ala	Ala	Ala	Thr	Ala	Trp	Phe	Leu	Pro	Ala	Leu	Ala		
145				150						155			160				
ctg	atc	gtg	ccg	atc	cac	tgg	ggc	gt	gcc	ctg	acc	ctg	ctg	acg	ctg	528	
Leu	Ile	Val	Pro	Ile	His	Trp	Gly	Val	Ala	Leu	Thr	Leu	Leu	Thr	Leu		
165				170						175							
atg	tcg	ctg	acg	gcc	cc	ctg	aa	c	at	gc	gg	cg	g	tc	tgg	576	
Met	Ser	Leu	Thr	Ala	Ala	Leu	Asn	His	Ala	Gly	Arg	Glu	Val	Trp	Pro		
180				185						190							
gcc	gcc	tgg	ctg	gag	cgg	gc	cc	tt	cg	tgg	ctg	atc	acc	gcc	acc	624	
Ala	Ala	Trp	Leu	Glu	Arg	Ala	Pro	Leu	Arg	Trp	Leu	Ile	Thr	Ala	Thr		
195				200						205							
cac	cac	gac	gcc	cac	cac	aag	cgg	ttc	aa	gga	aa	ac	tac	ggc	ctc	572	
His	His	Asp	Ala	His	His	Lys	Arg	Phe	Asn	Gly	Asn	Tyr	Gly	Leu	Tyr		
210				215						220							
ttc	cag	ttc	tgg	gac	cgc	tgg	gg	act	gag	gtt	tcg	gcc	gg	ccc		720	
Phe	Gln	Phe	Trp	Asp	Arg	Trp	Ala	Gly	Thr	Glu	Val	Ser	Ala	Ala	Pro		
225				230						235			240				
tcg	cca	cca	tcc	ccg	gtc	atc	cct	cca	gag	cgg	ccc	tca	g	cc	ttt	768	
Ser	Pro	Pro	Ser	Pro	Val	Ile	Pro	Pro	Glu	Arg	Pro	Ser	Ala	Pro	Leu		
245				250						255							
cg	tga															774	
Arg																	

<210> 4
 <211> 257
 <212> PRT
 <213> Brevundimonas sp.

<400> 4
 Met Leu Arg Asp Leu Leu Ile Thr Thr Leu Ala Leu Ser Leu Ile Ile
 1 5 10 15

Gly Leu Arg Tyr Leu Leu Val Gly Ala Ala Ala His Gly Leu Leu Trp
 20 25 30

Ala Gly Ala Gly Arg Gly Arg Ala Leu Asn Leu Arg Pro Pro Ala Met
 35 40 45

Lys Arg Ile Arg Ala Glu Ile Val Ala Ser Leu Ile Ala Cys Pro Ile
 50 55 60

Tyr Ala Leu Pro Ala Ala Leu Val Leu Glu Leu Trp Lys Arg Gly Gly
 65 70 75 80

Thr Ala Ile Tyr Ser Asp Pro Asp Ala Trp Pro Leu Trp Trp Leu Pro
 85 90 95

Val Ser Leu Ile Val Tyr Leu Leu Ala His Asp Ala Phe Tyr Tyr Trp
 100 105 110

Val His Arg Ala Leu His His Pro Arg Val Phe Gly Trp Ala His Ala
 115 120 125

Glu His His Arg Ser Arg Asp Pro Ser Ala Phe Ala Ser Phe Ala Phe
 130 135 140

Asp Pro Ala Glu Ala Ala Ala Thr Ala Trp Phe Leu Pro Ala Leu Ala
 145 150 155 160

Leu Ile Val Pro Ile His Trp Gly Val Ala Leu Thr Leu Leu Thr Leu
 165 170 175

Met Ser Leu Thr Ala Ala Leu Asn His Ala Gly Arg Glu Val Trp Pro
 180 185 190

Ala Ala Trp Leu Glu Arg Ala Pro Leu Arg Trp Leu Ile Thr Ala Thr
 195 200 205

His His Asp Ala His His Lys Arg Phe Asn Gly Asn Tyr Gly Leu Tyr
 210 215 220

Phe Gln Phe Trp Asp Arg Trp Ala Gly Thr Glu Val Ser Ala Ala Pro
 225 230 235 240

Ser Pro Pro Ser Pro Val Ile Pro Pro Glu Arg Pro Ser Ala Pro Leu
 245 250 255

Arg

<210> 5
<211> 25
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: Synthetic primer

<400> 5
tacgaattcg atgcccctcg ccctg 25

<210> 6
<211> 32
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: Synthetic primer

<400> 6
tagaggatcc tcaaggagtg aactggatcg ta 32

<210> 7
<211> 26
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: Synthetic primer

<400> 7
tacgaattcg atgaccgcccc ccgtcg 26

<210> 8
<211> 31
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: Synthetic primer

<400> 8
tagaggatcc tcaagactcg ccgcgccaca a 31

<210> 9
<211> 27
<212> DNA
<213> Artificial Sequence

<220>

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<223> Description of Artificial Sequence: Synthetic primer

<400> 9
tacgaattcg ctgtcgccga tgcaggc 27

<210> 10
<211> 32
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: Synthetic primer

<400> 10
tagaggatcc tgcggttcag cagccgataa aa 32

<210> 11
<211> 31
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: Synthetic primer

<400> 11
tacgaattcg atgcgagcag cagtgtatcg a 31

<210> 12
<211> 29
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: primer

<400> 12
tagaggatcc aagctcttgg agccctgct 29

<210> 13
<211> 27
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: Synthetic primer

<400> 13
tacgaattcg atgagcgacg ccgtcct 27

<210> 14
<211> 29
<212> DNA

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<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: Synthetic primer

<400> 14
tagaggatcc tcagatgtgg gtccacagg                                29

<210> 15
<211> 28
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: Synthetic primer

<400> 15
tacgaattcg atgatggcgg tggcgggc                                28

<210> 16
<211> 28
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: Synthetic primer

<400> 16
tagaggatcc cccacatctg acggcgct                                28

<210> 17
<211> 31
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: Synthetic primer

<400> 17
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<210> 18
<211> 28
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: Synthetic primer

<400> 18
tagaggatcc accgccatca tgacgagg                                28

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<210> 19
<211> 29
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: Synthetic primer

<400> 19
tacgaattcg atggcgatcg tcggcttaa 29

<210> 20
<211> 30
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: Synthetic primer

<400> 20
tagaggatcc ctagcgtcca agttcggcct 30

<210> 21
<211> 29
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: Synthetic primer

<400> 21
tacgaattcg atgcccaccc ccgacgacg 29

<210> 22
<211> 30
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: Synthetic primer

<400> 22
tagaggatcc tcagaagcgg ggctcttcca 30

<210> 23
<211> 30
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: Synthetic primer

<400> 23

tacgaattcg atggcctggc tgacgtggat	30
<210> 24	
<211> 29	
<212> DNA	
<213> Artificial Sequence	
<220>	
<223> Description of Artificial Sequence: Synthetic primer	
<400> 24	
tagaggatcc tcaggcgccg ctgctggaa	29
<210> 25	
<211> 32	
<212> DNA	
<213> Artificial Sequence	
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<223> Description of Artificial Sequence: Synthetic primer	
<400> 25	
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<210> 26	
<211> 29	
<212> DNA	
<213> Artificial Sequence	
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<223> Description of Artificial Sequence: Synthetic primer	
<400> 26	
tagaggatcc tcaccgaaga ggcgctgag	29
<210> 27	
<211> 29	
<212> DNA	
<213> Artificial Sequence	
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<223> Description of Artificial Sequence: Synthetic primer	
<400> 27	
tacgaattcg atgctgaaaac ggctgggtt	29
<210> 28	
<211> 31	
<212> DNA	
<213> Artificial Sequence	
<220>	

<223> Description of Artificial Sequence: Synthetic primer

<400> 28
tagaggatcc ctatttccag ttctgggacc g 31

<210> 29
<211> 486
<212> DNA
<213> Brevundimonas sp.

<220>
<221> CDS
<222> (1)..(483)

<400> 29 48
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Met Ala Trp Leu Thr Trp Ile Ala Leu Phe Leu Thr Ala Phe Leu Gly
1 5 10 15

atg gag gcg ttc gcc tgg atc atg cac cgc tat gtg atg cac ggt ttc 96
Met Glu Ala Phe Ala Trp Ile Met His Arg Tyr Val Met His Gly Phe
20 25 30

ctg tgg tcc tgg cac cgc agc cat cat gag ccg cac gat cac ccc ctg 144
Leu Trp Ser Trp His Arg Ser His His Glu Pro His Asp His Pro Leu
35 40 45

gag aag aac gac ctg ttc gcc gtg gtc ttc gcc gcc ccg gcc atc gtc 192
Glu Lys Asn Asp Leu Phe Ala Val Val Phe Ala Ala Pro Ala Ile Val
50 55 60

atg gtg gcc gtg ggt ctg cac ctg tgg ccc tgg gcc ctg ccg gtc ggc 240
Met Val Ala Val Gly Leu His Leu Trp Pro Trp Ala Leu Pro Val Gly
65 70 75 80

ctg ggg atc acg gcc tat ggg atg gtc tat ttc ttc ttc cac gac ggc 288
Leu Gly Ile Thr Ala Tyr Gly Met Val Tyr Phe Phe His Asp Gly
85 90 95

ctg gtg cac cgg cgg ttc ccg acg ggc ttt tcc ggg ccg tcc ggc ttc 336
Leu Val His Arg Arg Phe Pro Thr Gly Phe Ser Gly Arg Ser Gly Phe
100 105 110

tgg acg cgg cgc atc cag gcg cac cgt ctg cat cac gcc gtg cgc acg 384
Trp Thr Arg Arg Ile Gln Ala His Arg Leu His Ala Val Arg Thr
115 120 125

cgc gaa ggc tgc gtc tcc ttc ggc ttt ctg tgg gtg ccg tcg gcg ccg 432
Arg Glu Gly Cys Val Ser Phe Gly Phe Leu Trp Val Arg Ser Ala Arg
130 135 140

gcg ctg aag gcc gaa ctg gct cag aag cgg ggc tct tcc agc agc ggc 480
Ala Leu Lys Ala Glu Leu Ala Gln Lys Arg Gly Ser Ser Ser Ser Gly
145 150 155 160

gcc tga 486

Ala

<210> 30
<211> 161
<212> PRT
<213> Brevundimonas sp.

<400> 30
Met Ala Trp Leu Thr Trp Ile Ala Leu Phe Leu Thr Ala Phe Leu Gly
1 5 10 15

Met Glu Ala Phe Ala Trp Ile Met His Arg Tyr Val Met His Gly Phe
20 25 30

Leu Trp Ser Trp His Arg Ser His His Glu Pro His Asp His Pro Leu
35 40 45

Glu Lys Asn Asp Leu Phe Ala Val Val Phe Ala Ala Pro Ala Ile Val
50 55 60

Met Val Ala Val Gly Leu His Leu Trp Pro Trp Ala Leu Pro Val Gly
65 70 75 80

Leu Gly Ile Thr Ala Tyr Gly Met Val Tyr Phe Phe Phe His Asp Gly
85 90 95

Leu Val His Arg Arg Phe Pro Thr Gly Phe Ser Gly Arg Ser Gly Phe
100 105 110

Trp Thr Arg Arg Ile Gln Ala His Arg Leu His His Ala Val Arg Thr
115 120 125

Arg Glu Gly Cys Val Ser Phe Gly Phe Leu Trp Val Arg Ser Ala Arg
130 135 140

Ala Leu Lys Ala Glu Leu Ala Gln Lys Arg Gly Ser Ser Ser Ser Gly
145 150 155 160

Ala

<210> 31
<211> 897
<212> DNA
<213> Brevundimonas sp.

<220>
<221> CDS
<222> (1)..(894)

<400> 31
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Met Ala Ile Val Gly Leu Arg Pro Gln Pro Val Ser Asp Pro Glu Pro
1 5 10 15

cag tcg ccc gag aat ctg cgt ggc ctg gtg cag gac cgg ctg gcc gag Gln Ser Pro Glu Asn Leu Arg Gly Leu Val Gln Asp Arg Leu Ala Glu	20	25	30	96	
acg gcg ccc tca tcg gac ggt ctt tta gcc ctc gcc gcg cgc gag gcc Thr Ala Pro Ser Ser Asp Gly Leu Leu Ala Leu Ala Ala Arg Glu Ala	35	40	45	144	
ctg ctg gga ccg ggc aag cgg gtc agg ccg gtc gtg gcc atg ttg gcc Leu Leu Gly Pro Gly Lys Arg Val Arg Pro Val Val Ala Met Leu Ala	50	55	60	192	
gcc gcg cac gtc ggc ggg cgg gcc gag gac gcc ctg gat ttc ggt tgc Ala Ala His Val Gly Gly Arg Ala Glu Asp Ala Leu Asp Phe Gly Cys	65	70	75	80	240
gcg gtc gaa atg gcc cat gcc gcc tcc ctg gtt ctg gac gac ctg ccc Ala Val Glu Met Ala His Ala Ala Ser Leu Val Leu Asp Asp Leu Pro	85	90	95	288	
tgt atg gat gat gcg gcc ttg cgg cgc ggt cag ccg acc ctg cac cgc Cys Met Asp Asp Ala Ala Leu Arg Arg Gly Gln Pro Thr Leu His Arg	100	105	110	336	
cgc cac ggc gag gat gcg gcc gtg ctg gcg gcc gtg gcc ctt ttg aac Arg His Gly Glu Asp Ala Ala Val Leu Ala Ala Val Ala Leu Leu Asn	115	120	125	384	
caa tcg acc cgg ctg att ctg caa agc cgg gcg ccg tcg gag gcg cgg Gln Ser Thr Arg Leu Ile Leu Gln Ser Arg Ala Pro Ser Glu Ala Arg	130	135	140	432	
ctg ggc gcc ctg gac gat ttg acg cag gcg atc ggc ttc gac ggc ctg Leu Gly Ala Leu Asp Asp Leu Thr Gln Ala Ile Gly Phe Asp Gly Leu	145	150	155	160	480
gcc gag ggc cag atg cgc gat ctg cgc gac gat ccc gtt cag cgc gac Ala Glu Gly Gln Met Arg Asp Leu Arg Asp Asp Pro Val Gln Arg Asp	165	170	175	528	
gtg gtc gcc ctg cgt cgg atc aac gat ctg aag acc ggc gcc ctg ttc Val Val Ala Leu Arg Arg Ile Asn Asp Leu Lys Thr Gly Ala Leu Phe	180	185	190	576	
gtc gcg gcc gcg cgg ggc ggc cgg atg ggc ggc ggc gat gcg gac Val Ala Ala Arg Gly Gly Arg Met Gly Gly Asp Ala Asp	195	200	205	624	
gac ctg gcg cgt ctc gcc gcc ttc ggc gaa gcg gtc ggc ttc gcc ttc Asp Leu Ala Arg Leu Ala Ala Phe Gly Glu Ala Val Gly Phe Ala Phe	210	215	220	672	
cag ctt tgc gac gac ctg atg gac gcc tgt tcg acg agc gag gcc ttg Gln Leu Cys Asp Asp Leu Met Asp Ala Cys Ser Thr Ser Glu Ala Leu	225	230	235	240	720
ggc aag gac gtc ggt cag gat cag ggc gtc acc acc ttc gtc gac ctg 19				768	

Gly	Lys	Asp	Val	Gly	Gln	Asp	Gln	Gly	Val	Thr	Thr	Phe	Val	Asp	Leu	
245									250					255		
tgg	ggc	gaa	ggc	cg	gtc	cgc	gcc	gg	gtg	cgc	cag	tca	ctg	gcc	cg	816
Trp	Gly	Glu	Gly	Arg	Val	Arg	Ala	Gly	Val	Arg	Gln	Ser	Leu	Ala	Arg	
260					265								270			
g	g	g	g	g	g	c	a	g	c	a	g	c	c	t	864	
Ala	Ala	Glu	Ala	Val	Gly	His	Asp	Ser	Pro	Leu	Thr	Thr	Tyr	Val	Leu	
275					280							285				
cat	ctc	ttc	cg	ca	g	gg	aa	ctt	gga	cg	ta	tc	tt		897	
His	Leu	Phe	Arg	Gln	Ala	Glu	Leu	Gly	Arg							
290					295											
<210> 32																
<211> 298																
<212> PRT																
<213> Brevundimonas sp.																
<400> 32																
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Gln	Ser	Pro	Glu	Asn	Leu	Arg	Gly	Leu	Val	Gln	Asp	Arg	Leu	Ala	Glu	
20					25					30						
Thr	Ala	Pro	Ser	Ser	Asp	Gly	Leu	Leu	Ala	Leu	Ala	Ala	Arg	Glu	Ala	
35					40					45						
Leu	Leu	Gly	Pro	Gly	Lys	Arg	Val	Arg	Pro	Val	Val	Ala	Met	Leu	Ala	
50					55					60						
Ala	Ala	His	Val	Gly	Gly	Arg	Ala	Glu	Asp	Ala	Leu	Asp	Phe	Gly	Cys	
65					70					75			80			
Ala	Val	Glu	Met	Ala	His	Ala	Ala	Ser	Leu	Val	Leu	Asp	Asp	Leu	Pro	
	85							90				95				
Cys	Met	Asp	Asp	Ala	Ala	Leu	Arg	Arg	Gly	Gln	Pro	Thr	Leu	His	Arg	
	100							105				110				
Arg	His	Gly	Glu	Asp	Ala	Ala	Val	Leu	Ala	Ala	Val	Ala	Leu	Leu	Asn	
	115							120				125				
Gln	Ser	Thr	Arg	Leu	Ile	Leu	Gln	Ser	Arg	Ala	Pro	Ser	Glu	Ala	Arg	
	130				135					140						
Leu	Gly	Ala	Leu	Asp	Asp	Leu	Thr	Gln	Ala	Ile	Gly	Phe	Asp	Gly	Leu	
145					150					155			160			
Ala	Glu	Gly	Gln	Met	Arg	Asp	Leu	Arg	Asp	Asp	Pro	Val	Gln	Arg	Asp	
	165							170				175				
Val	Val	Ala	Leu	Arg	Arg	Ile	Asn	Asp	Leu	Lys	Thr	Gly	Ala	Leu	Phe	
	180							185				190				

Val Ala Ala Ala Arg Gly Gly Gly Arg Met Gly Gly Asp Ala Asp
195 200 205

Asp Leu Ala Arg Leu Ala Ala Phe Gly Glu Ala Val Gly Phe Ala Phe
210 215 220

Gln Leu Cys Asp Asp Leu Met Asp Ala Cys Ser Thr Ser Glu Ala Leu
225 230 235 240

Gly Lys Asp Val Gly Gln Asp Gln Gly Val Thr Thr Phe Val Asp Leu
245 250 255

Trp Gly Glu Gly Arg Val Arg Ala Gly Val Arg Gln Ser Leu Ala Arg
260 265 270

Ala Ala Glu Ala Val Gly His Asp Ser Pro Leu Thr Thr Tyr Val Leu
275 280 285

His Leu Phe Arg Gln Ala Glu Leu Gly Arg
290 295

<210> 33

<211> 40

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: Synthetic primer

<400> 33

gtcccgagaa ggaggctaga tatgtccgct cacgctttgc

40

<210> 34

<211> 40

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: Synthetic primer

<400> 34

cggcggccgc cggggactaa gcggtgtcac cttggttct

40

<210> 35

<211> 30

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: Synthetic primer

<400> 35

atgcggccgc ttataaggac agcccgaatg

30

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<210> 36
<211> 30
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: Synthetic primer

<400> 36
cagtcgacat ccttaactga cggcagcgag 30

<210> 37
<211> 20
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: Synthetic primer

<220>
<221> misc_feature
<222> (9)..(9)
<223> n is I

<220>
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<223> n is I

<220>
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<222> (15)..(15)
<223> n is I

<220>
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<222> (18)..(18)
<223> n is I

<400> 37
ttygaygcng gnccnacngt 20

<210> 38
<211> 20
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: Synthetic primer

<220>

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<221> misc_feature
<222> (3)..(3)
<223> n is I

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<221> misc_feature
<222> (9)..(9)
<223> n is I

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<222> (12)..(12)
<223> n is I

<220>
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<222> (15)..(15)
<223> n is I

<220>
<221> misc_feature
<222> (18)..(18)
<223> n is I

<400> 38
ccnggrtgng tnccngcncc
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20